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Procurement Process Challenges, Issues, and Lessons Learned from IER 305 and IER 441

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NCSP Technical Program Review

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OVERVIEW

- IER 441 Assembly Overview
- Difference Between IER 305 AND IER 441
  - Central Test Region Assembly
  - Hex Pitch
- IER 441 Procurement Issues and Delays
  - New Hardware
- SPRF/CX: IER 441 Hardware Test fit (Success)
- Lessons Learned
- Acknowledgements

IER 441 Assembly Overview

REACTIVITY AND CONTROL ROD BUNDLE ASSEMBLY, 1.02 HEX PITCH (J92803)

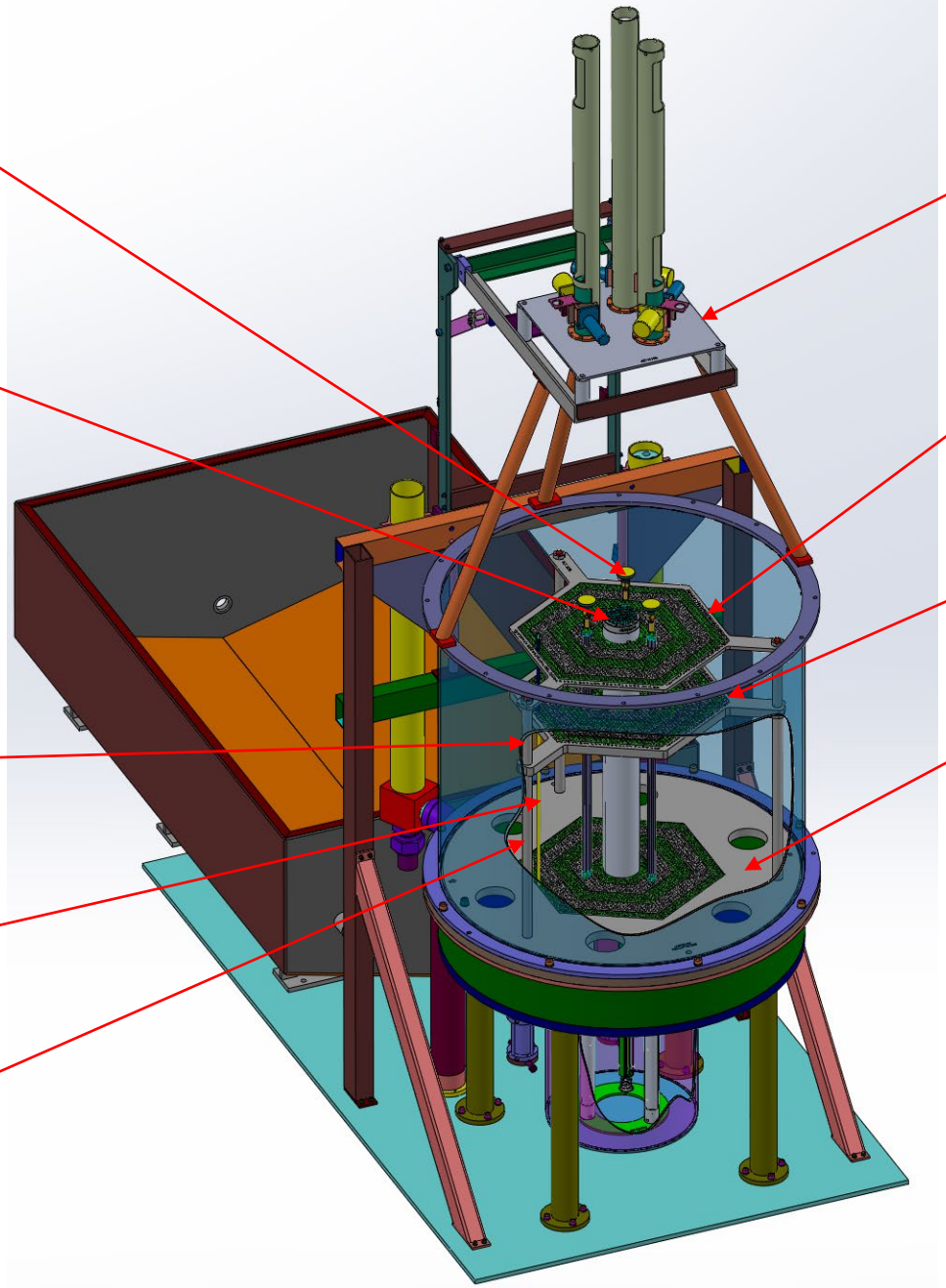
CENTRAL TEST REGION ASSEMBLY, 0.81cm HEX PITCH (J92808)

- 85X 7uPCX TANTALUM TEST ROD (J92810)

GUIDE GRID PLATE STANDOFF (J92801)

7uPCX TEST ROD

LOWER GRID PLATE STANDOFF (J92799)



DRIVE MOUNTING PLATE, 1.02cm HEX PITCH (J92811)

UPPER GRID PLATE GUIDE, 1.02cm HEX PITCH (J92802)

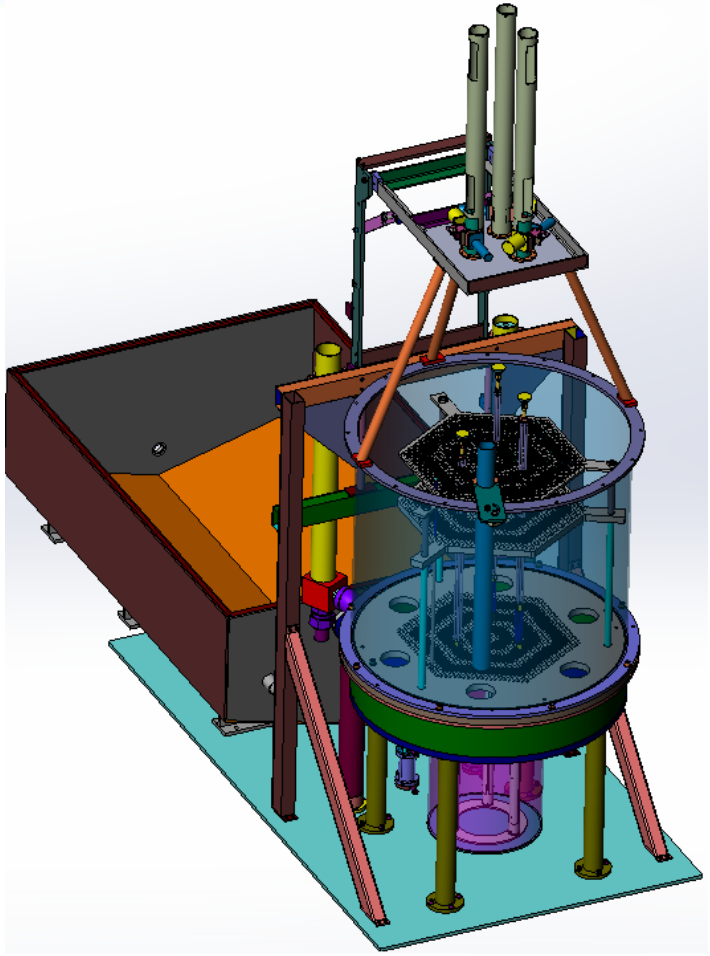
UPPER GRID PLATE, 1.02cm HEX PITCH (J92800)

LOWER GRID PLATE AND HYDRO TUBE ASSEMBLY, 1.02cm HEX PITCH, (J92792)

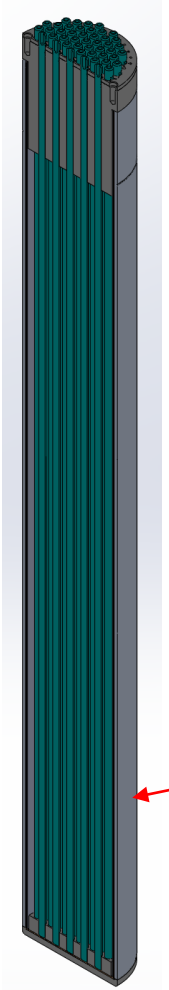
- HYDRO TUBE ASSEMBLY, 1.02cm HEX PITCH (J92794)
- HYDRO TUBE SPACER, 1.02cm HEX PITCH (J92797)

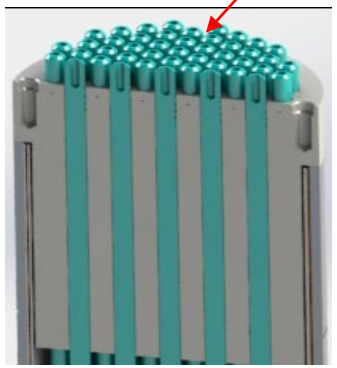
Difference Between IER 305 AND IER 441

IER 305
- 1.55cm Hex Pitch

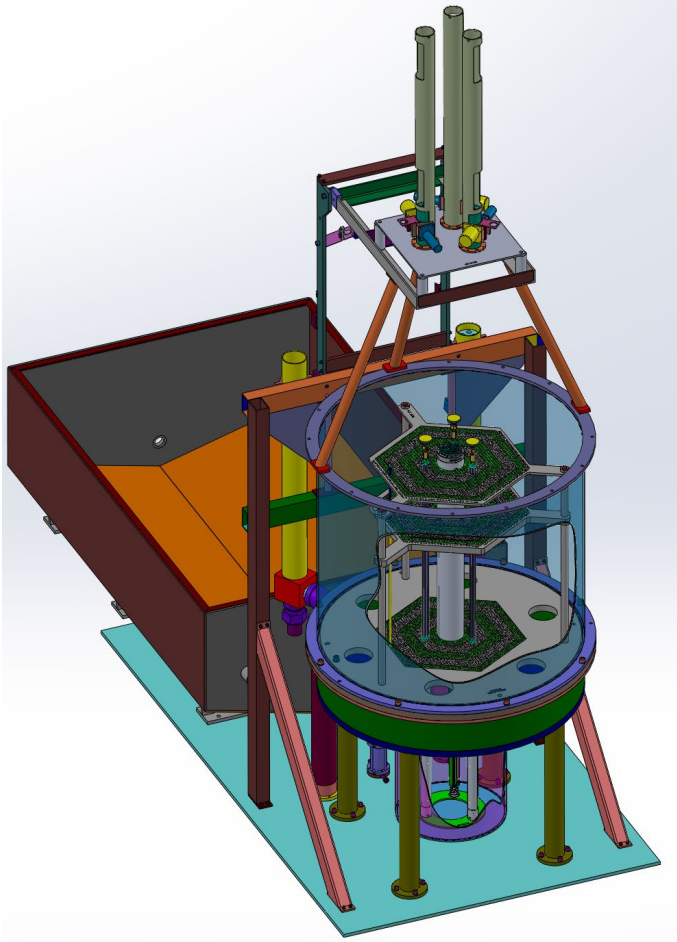


Central Test Region
- 0.81cm Hex Pitch

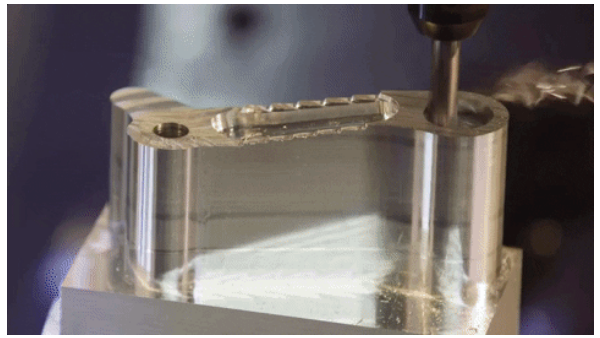




IER 441
- 1.02cm Hex Pitch



Manufacturing, Delivery, & Mission Success



There is a lot of inherent risk associated with manufacturing

- R&D hardware difficult to estimate timeframe due to first of a kind products
- Machining queue (other customers' work can affect your schedule)
- Machine goes down
- Human or machine error and part is scraped
- Inexperience and short supply of capable machinist
- Subcontractor delays
- Material or hardware is not readily available (MS cannot be substituted with commercial hardware)
- Requestor (Redline, Updated, Modifications, Qty Changes, etc.)
- Rework

ML's Process Stream Map

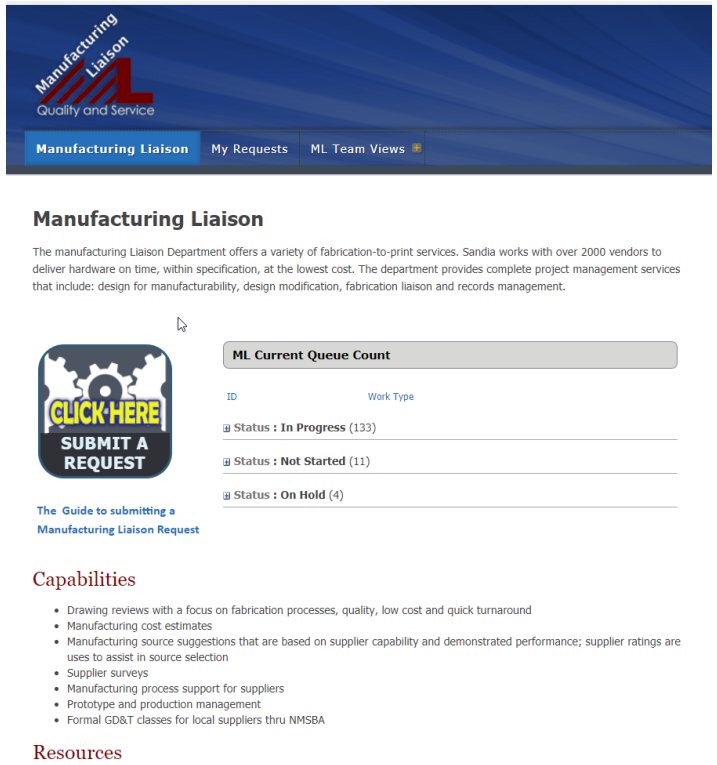
Start

Requestor

Submit Request

Work type
Build, Modify/ Fix, Quote, Design for MFG review. Inspection

- Who's SBS701 is current Complete Manufacturing Liaison Request Form
- Users request service through ML SharePoint site



Technical Fabrication Coordinator

Review the Manufacturing Liaison Request Order.

Generate PR and RFQ

Helps determine possible suppliers generated PR / RFQ in Oracle system which sent automatically notifications suppliers

When the RFQ closes, forwards all quotes to the Requestor.

Suppliers

Respond to RFQ

Inspector

Requestor

Evaluate Bids LBMS

TFC or SP

TFC's are Delegated Buyer under a SP

- If PO is awarded to a non-CPA manufacturer or is valued over $25k, an SP must approve it.

PO is Executed as appropriate

TFC

- Coordinate pick-up and delivery of fabricated goods to Requester.

Delivery to Requestor

TFC

Archive inspection reports, material certifications, and any other pertinent documentation from the Supplier in Oracle

End

IER-441: New Hardware Tracking Spreadsheet

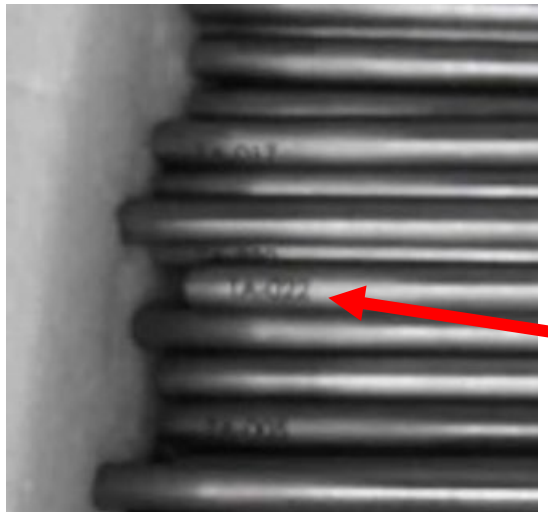
		Manufacturing						
Description	Qty	MAX, ML, PO #	Company	Awarded	Promise Date	Received Date	On Time	Comments
HYDRO TUBE ALIGNMENT GAGE HANDLE	1	ML-55721	Alva	5/17/2023	7/5/2023	8/17/2023	No	
LOWER GRID PLATE STANDOFF	3	ML-55721	Alva	5/17/2023	7/5/2023	8/8/2023	No	
GUIDE GRID PLATE STANDOFF	3	ML-55721	Alva	5/17/2023	7/5/2023	8/8/2023	No	
UPPER GRID PLATE GUIDE, 1.02cm HEX PITCH	**1**	**ML-55721**	**Alva**	5/17/2023	**7/5/2023**	**Canceled**	**No**	**Remove part from contract**
UPPER GRID PLATE GUIDE, 1.02cm HEX PITCH	**1**	**ML-56800**	**Ridgeline**	**10/4/2023**	**11/16/2023**	**12/1/2023**	**No**	**Non Conformance Issues**
UPPER GRID PLATE GUIDE, 1.02cm HEX PITCH	**1**	**(MAXIMO)**	**BackerWorks**	**1/2/2024**	**2/16/2024**	**2/1/2024**	**Yes**	**Additional Holes Deburr Required**
BUNDLE PLATE LOWER, 1.02cm HEX PITCH	6	ML-55721	Alva	5/17/2023	7/5/2023	9/13/2023	No	
BUNDLE PLATE MIDDLE, 1.02cm HEX PITCH	12	ML-55721	Alva	5/17/2023	7/5/2023	9/14/2023	No	
BUNDLE PLATE UPPER, 1.02cm HEX PITCH	6	ML-55721	Alva	5/17/2023	7/5/2023	9/14/2023	No	
DRIVE MOUNTING PLATE, 1.02cm HEX PITCH	1	ML-55721	Alva	5/17/2023	7/5/2023	9/8/2023	No	
HYDRO TUBE ALIGNMENT GAGE ASSEMBLY, 1.02cm HEX PITCH	1	ML-55721	Alva	5/17/2023	7/5/2023	8/17/2023	No	
HYDRO TUBE ALIGNMENT GAGE, 1.02cm PITCH	1	ML-55721	Alva	5/17/2023	7/5/2023	8/17/2023	No	
LOWER GRID PLATE AND HYDRO TUBE ASSEMBLY, 1.02cm HEX PITCH	1	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
LOWER GRID PLATE, 1.02cm HEX PITCH	1	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
HYDRO TUBE ASSEMBLY, 1.02cm HEX PITCH	3	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
HYDRO TUBE SPRING ASSEMBLY, 1.02cm HEX PITCH	9	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
HYDRO TUBE, SPRING RETAINER	9	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
HYDRO TUBE SPACER, 1.02cm HEX PITCH	6	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
LOWER GUIDE RING ASSEMBLY, 1.02cm HEX PITCH	1	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
UPPER GRID PLATE, 1.02cm HEX PITCH	1	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
HYDRO TUBE, 1.50 INCH	3	ML-55092	BackerWorks	5/3/2023	8/1/2023	8/14/2023	No	
CENTRAL TEST REGION BRACKET	2	ML-55722	Ridgeline mfg.	5/3/2023	8/1/2023	10/24/2023	No	
CENTRAL TEST REGION ASSEMBLY, 0.81cm HEX PITCH	1	ML-55722	Ridgeline mfg.	5/3/2023	8/1/2023	10/24/2023	No	
CENTRAL TEST REGION WELDMENT, 0.81cm HEX PITCH	1	ML-55722	Ridgeline mfg.	5/3/2023	8/1/2023	10/24/2023	No	
7uPCX TANTALUM TEST ROD	**95**	**ML-55814**	**Eagle**	**5/9/2023**	**6/27/2023**	**6/7/2023**	**Yes**	**Remark Rods Using Laser Marking**
	170							

History of Procurement Issues

- Original request for quote (RFQ) went out on 03/28/2023
  - Manufacturing Liaison Request **ML-54879**
- No bids received, so reissued as four separate RFQs on 04/25/2023
  - **ML-55721, ML-55722, ML-55814, & ML-55892**
  - Requested Delivery Date of 08/01/2023
- By 05/01/2023 contracts were in place for all new equipment
  - Required additional attention (plenty of poking and prodding)
  - No bid for **ML-55722** (central test region parts)
    - Contacted Ridgeline MFG and convinced them to submit a quote
- Nearly all parts delivered well past the promise dates
- Guide Plate – The "Problem Child" of the group
  - 1st Attempt: Alva MFG (**ML-55271**) – Promise Date 07/05/2023, Never Received
    - Multiple delays led to termination of the contract for the guide plate on 11/01/2023
    - Additionally, Alva delivered other parts, but on 9 separate shipments: Created additional work for tracking and receipt inspections
  - 2nd Attempt: Ridgeline MFG (**ML-56800**) – Promise Date 11/16/2023, Received 12/01/2023
    - Non conformances (not anodized, holes not chamfered, etc.)
    - Sent back to Ridgeline for corrections
    - Reworked guide plate still did not meet requirements
  - 3rd Attempt: Backerworks MFG (**Maximo**) – Promise Date 02/16/2024, Received 02/01/2024
    - Returned for issues with holes (team visited Backerworks with guide and grid plates to discuss fixes)
    - **Guide plate finished and will be inspected on 02/14/24**

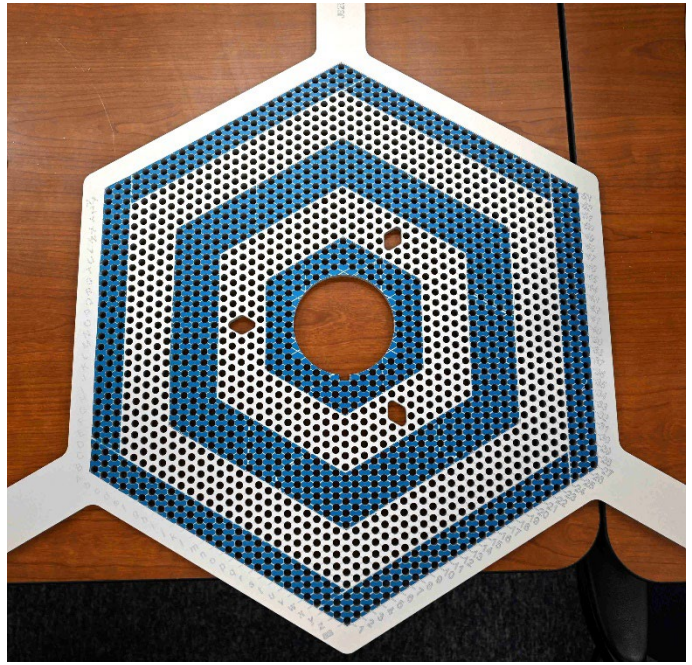
Tantalum Rod Marking (Eagle Mfg.) Delivered On Time

- Had to re-mark serial number per drawing requirements
  - Laser marking was done by SNL TA-5 machine shop
- The issue with the original marking process (stencil): not permanent – rubbing off some of the rods after minimal handling

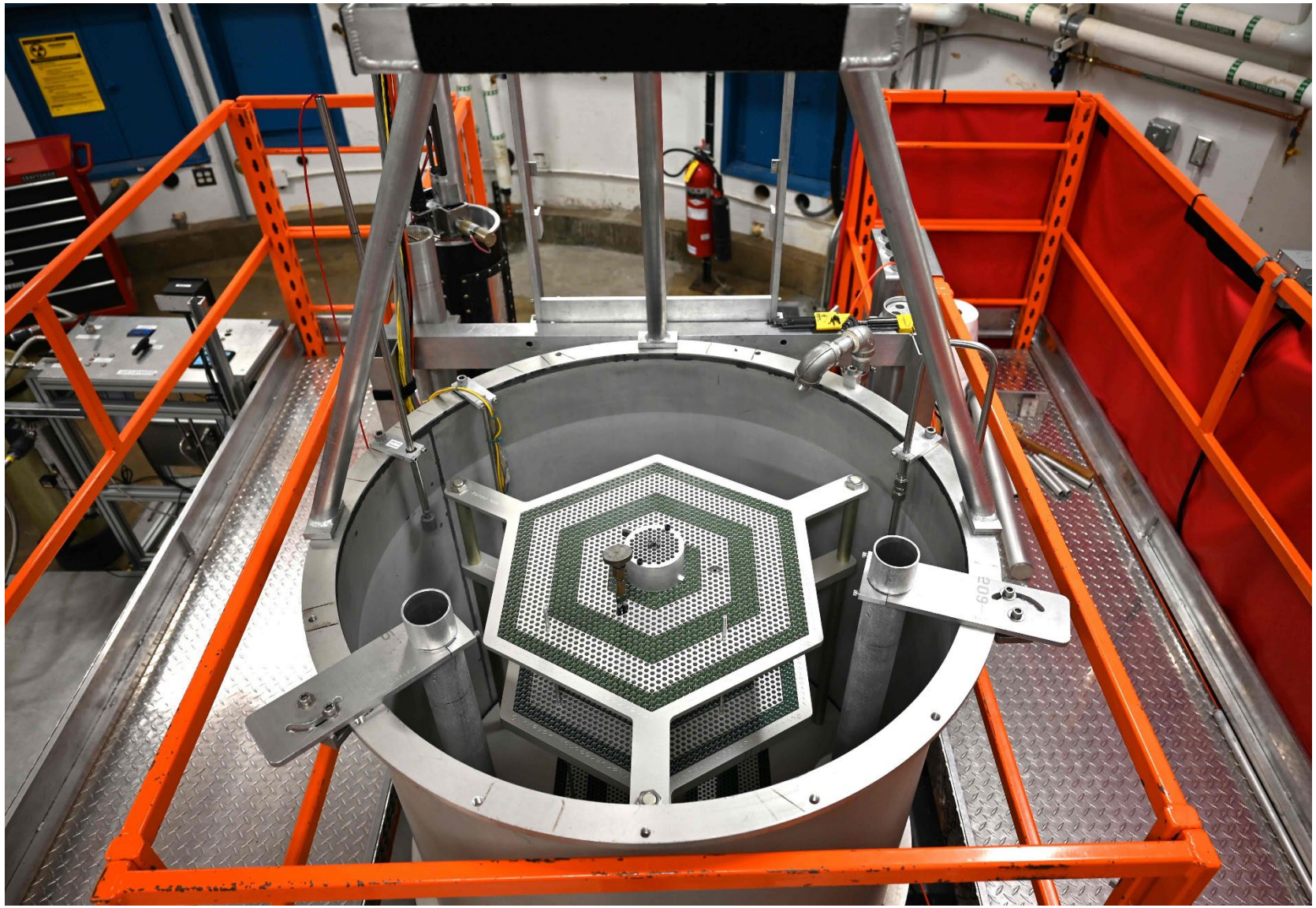


Guide Plate Non Conformance (Ridgeline Mfg.)

- Anodize color not consistent with other grid plates
  - This issue alone could have been overlooked
- Chamfer on CE/SE cutouts on both sides did not meet drawing requirements
  - Control and Safety Elements do not drop correctly and may get held up
- “Addressing Lines” had errors and did not meet drawing requirements
- Grid plate holes not chamfered and deburred properly even after reworked
  - Outside of fuel rods being shaved off when loaded/unloaded



SPRF/CX: IER 441 Hardware Test fit (Success)



Conclusions

- IER 441 was the most challenging hardware procurement to date.
- I would consider using a sole-source/sole-make justification as required by the Department of Energy/National Nuclear Security Administration (DOE/NNSA).
- Once you submit ML RFQ and get bids you are required to select the company that has the best price and promise date.
- There are no consequences for companies that deliverer late, however suppliers are sent a corrective action plan when their score falls below an acceptable level.

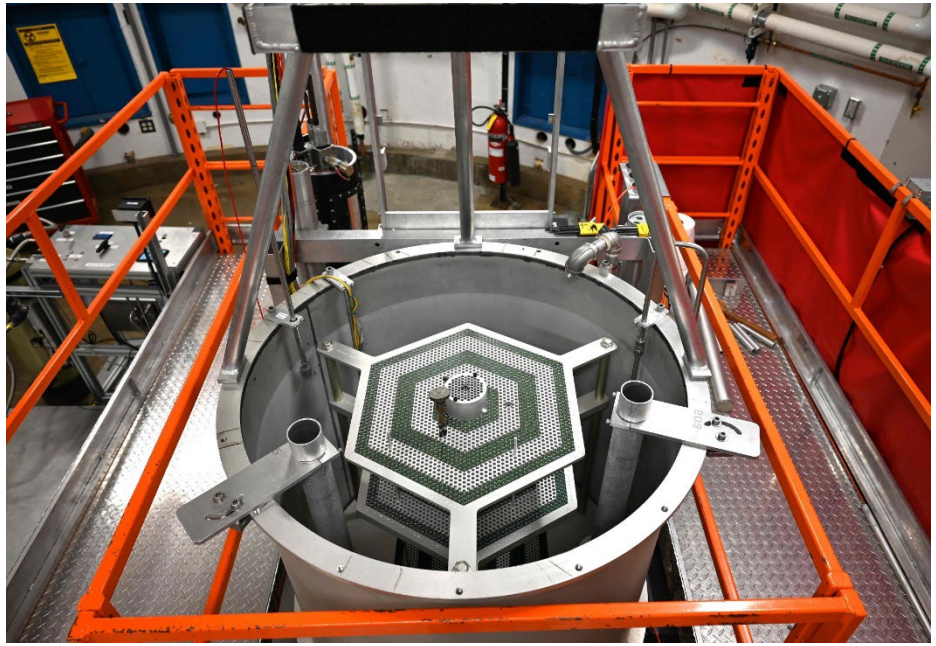
Lessons Learned:

- A little delay can cause an exponential increase in lead time.
- Money can't always buy time.
- Understand risk from start to finish.
- Be aware of government procurement policies and regulations.
- Build and maintain good relationships (design team, manufacturers, ML, etc.).
- Focus on organization throughout the process (models, drawings, inspections, discussions, team dynamics, etc.)

Acknowledgements

Thank you!

- DOE NCSP: The critical experiments at Sandia are supported by the DOE Nuclear Criticality Safety Program (NCSP), funded and managed by the National Nuclear Security Administration for the Department of Energy.



Questions?

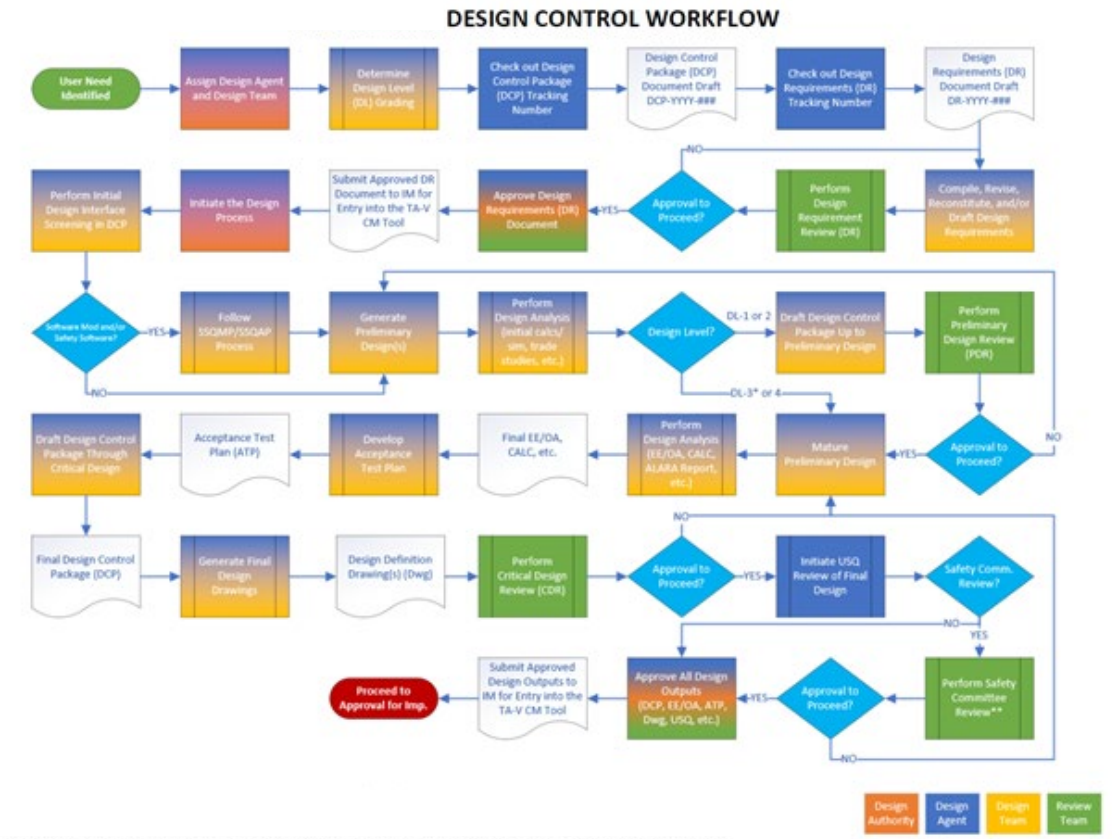
Design Control Requirements

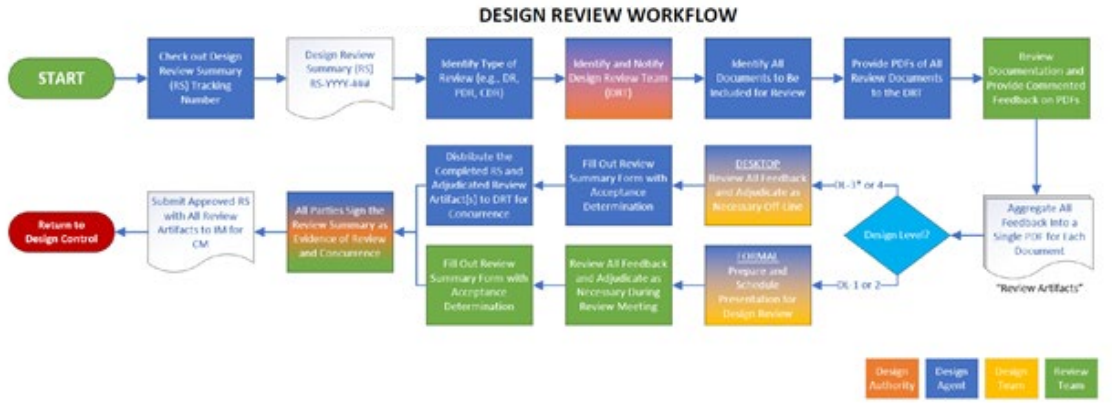
Design Team

- Experimenters: David Ames, Gary Harms, Elijah Lutz
- Facility & Operations: Beth Hanson, Jason Soars, Patrick Ward
- Product Design: Augie Chapa, Alex Mace
- System Engineering & QA: Cassandra Wilson, Michael Black

Notable items required for newly implemented NQA-1 process

- Total documents (39)
- Total pages (over 250)
- Required signatures (105)
- Approval to proceed steps (4)
- Design Drawings (over 30)
- Additional Requirements (design analysis, acceptance test plan, committee reviews, bidding process, etc.)





IER 441 OVERVIEW

- Control and Safety Element bundle plates
  - Maintain spacing of the 4 rod clusters
- Grid Plates (Guide, Upper, and Lower)
  - Maintain spacing of fuel rods
  - Triangular pitch (1.02 cm)
- Central test region
  - Outer Diameter 9.5 cm
  - Length 78 cm
  - Dry cavity
  - Lined with cadmium
  - Maintain spacing of test rods
  - 85 test rod locations
  - Triangular pitch (0.81 cm)
- Tantalum rods
  - Pure tantalum (> 99.95%)
  - Dimensions match fuel rods (about 1 cm longer)
- Hydro Tubes and Springs
  - Gravity drop of control and safety elements